220. What type of filter should be installed on an amateur transmitter as the first step in reducing harmonic radiation? [2D-8-2.6]
A. Key click filter
B. Low pass filter
C. High pass filter
D. CW filter

221. If you are notified that your amateur station is causing television interference, what should you do first? [2D-8-3.1]
A. Make sure that your amateur equipment is operating properly, and that it does not cause interference to your own television
B. Immediately turn off your transmitter and contact the nearest FCC office for assistance
C. Install a high-pass filter at the transmitter output and a low-pass filter at the antenna-input terminals of the TV
D. Continue operating normally, since you have no legal obligation to reduce or eliminate the interference

222. Your neighbor informs you that you are causing television interference, but you are sure your amateur equipment is operating properly and you cause no interference to your own TV. What should you do? [2D-8-3.2]
A. Immediately turn off your transmitter and contact the nearest FCC office for assistance
B. Work with your neighbor to determine that you are actually the cause of the interference
C. Install a high-pass filter at the transmitter output and a low-pass filter at the antenna-input terminals of the TV
D. Continue operating normally, since you have no legal obligation to reduce or eliminate the interference

SUBELEMENT 2E - Electrical Principles (4 questions)

One (1) question should be from the following:

223. Your receiver dial is calibrated in megahertz and shows a signal at 1200 MHz. At what frequency would a dial calibrated in gigahertz show the signal? [2E-1-1.1]
A. 1,200,000 GHz
B. 12 GHz
C. 1.2 GHz
D. 0.0012 GHz

224. Your receiver dial is calibrated in kilohertz and shows a signal at 7125 kHz. At what frequency would a dial calibrated in megahertz show the signal? [2E-1-2.1]
A. 0.007125 MHz
B. 7.125 MHz
C. 71.25 MHz
D. 7,125,000 MHz

225. Your receiver dial is calibrated in gigahertz and shows a signal at 1.2 GHz. At what frequency would a dial calibrated in megahertz show the same signal? [2E-1-2.2]
A. 1.2 MHz
B. 12 MHz
C. 120 MHz
D. 1200 MHz

226. Your receiver dial is calibrated in megahertz and shows a signal at 3.525 MHz. At what frequency would a dial calibrated in kilohertz show the signal? [2E-1-3.1]
A. 0.003525 kHz
B. 3525 kHz
C. 35.25 kHz
D. 3,525,000 kHz

227. Your receiver dial is calibrated in kilohertz and shows a signal at 3725 kHz. At what frequency would a dial calibrated in Hertz show the same signal? [2E-1-3.2]
A. 3,725 Hz
B. 3.725 Hz
C. 37.25 Hz
D. 3,725,000 Hz

228. How long (in meters) is an antenna that is 400 centimeters long? [2E-1-4.1]
A. 0.0004 meters
B. 4 meters
C. 40 meters
D. 40,000 meters

229. What reading will be displayed on a meter calibrated in amperes when it is being used to measure a 3000-milliampere current? [2E-1-5.1]
A. 0.003 amperes
B. 0.3 amperes
C. 3 amperes
D. 3,000,000 amperes

230. What reading will be displayed on a meter calibrated in volts when it is being used to measure a 3500-millivolt potential? [2E-1-5.2]
A. 350 volts
B. 35 volts
C. 3.5 volts
D. 0.35 volts

231. How many farads is 500,000 microfarads? [2E-1-6.1]
A. 0.0005 farads
B. 0.5 farads
C. 500 farads
D. 500,000,000 farads

232. How many microfarads is 1,000,000 picofarads? [2E-1-7.1]
A. 0.001 microfarads
B. 1 microfarad
C. 1,000 microfarads
D. 1,000,000,000 microfarads

One (1) question should be from the following:

233. What is the term used to describe the flow of electrons in an electric circuit? [2E-2-1.1]
A. Voltage
B. Resistance
C. Capacitance
D. Current

234. What is the basic unit of electric current? [2E-2-2.1]
A. The volt
B. The watt
C. The ampere
D. The ohm

235. What supplies the force that will cause electrons to flow through a circuit? [2E-3-1.1]
A. Electromotive force, or voltage
B. Magnetomotive force, or inductance
C. Farad force, or capacitance
D. Thermodynamic force, or entropy

236. The pressure in a water pipe is comparable to what force in an electrical circuit? [2E-3-1.2]
A. Current
B. Resistance
C. Gravitation
D. Voltage

237. An electric circuit must connect to two terminals of a voltage source. What are these two terminals called? [2E-3-1.3]
A. The north and south poles
B. The positive and neutral terminals
C. The positive and negative terminals
D. The entrance and exit terminals

238. What is the basic unit of voltage? [2E-3-2.1]
A. The volt
B. The watt
C. The ampere
D. The ohm

239. List at least three good electrical conductors. [2E-4.1]
A. Copper, gold, mica
B. Gold, silver, wood
C. Gold, silver, aluminum
D. Copper, aluminum, paper

240. List at least four good electrical insulators. [2E-5.1]
A. Glass, air, plastic, porcelain
B. Glass, wood, copper, porcelain
C. Paper, glass, air, aluminum
D. Plastic, rubber, wood, carbon

241. There is a limit to the electric current that can pass through any material. What is this current limiting called? [2E-6-1.1]
A. Fusing
B. Reactance
C. Saturation
D. Resistance

242. What is an electrical component called that opposes electron movement through a circuit? [2E-6-1.2]
A. A resistor
B. A reactor
C. A fuse
D. An oersted

243. What is the basic unit of resistance? [2E-6-2.1]
A. The volt
B. The watt
C. The ampere
D. The ohm

One (1) question should be from the following:

244. What electrical principle relates voltage, current and resistance in an electric circuit? [2E-7.1]
A. Ampere's Law
B. Kirchhoff's Law
C. Ohm's Law
D. Tesla's Law

245. There is a 2-amp current through a 50-ohm resistor. What is the applied voltage? [2E-7.2]
A. 0.04 volts
B. 52 volts
C. 100 volts
D. 200 volts

246. If 200 volts is applied to a 100-ohm resistor, what is the current through the resistor? [2E-7.3]
A. 0.5 amps
B. 2 amps
C. 50 amps
D. 20000 amps

247. There is a 3-amp current through a resistor and we know that the applied voltage is 90 volts. What is the value of the resistor? [2E-7.4]
A. 0.03 ohms
B. 10 ohms
C. 30 ohms
D. 2700 ohms

248. What is the term used to describe the ability to do work? [2E-8.1]
A. Voltage
B. Power
C. Inertia
D. Energy

249. What is converted to heat and light in an electric light bulb? [2E-8.2]
A. Electrical energy
B. Electrical voltage
C. Electrical power
D. Electrical current

250. What term is used to describe the rate of energy consumption? [2E-9-1.1]
A. Energy
B. Current
C. Power
D. Voltage

251. You have two lamps with different wattage light bulbs in them. How can you determine which bulb uses electrical energy faster? [2E-9-1.2]
A. The bulb that operates from the higher voltage will consume energy faster
B. The physically larger bulb will consume energy faster
C. The bulb with the higher wattage rating will consume energy faster
D. The bulb with the lower wattage rating will consume energy faster

252. What is the basic unit of electrical power? [2E-9-2.1]
A. Ohm
B. Watt
C. Volt
D. Ampere

253. What is the term for an electrical circuit in which there can be no current? [2E-10.1]
A. A closed circuit
B. A short circuit
C. An open circuit
D. A hyper circuit

254. What is the term for a failure in an electrical circuit that causes excessively high current? [2E-11.1]
A. An open circuit
B. A dead circuit
C. A closed circuit
D. A short circuit

One (1) question should be from the following:

255. What is the term used to describe a current that flows only in one direction? [2E-12-1.1]
A. Alternating current
B. Direct current
C. Periodic current
D. Pulsating current

256. What is the term used to describe a current that flows first in one direction, then in the opposite direction, over and over? [2E-12-2.1]
A. Alternating current
B. Direct current
C. Negative current
D. Positive current

257. What is the term for the number of complete cycles of an alternating waveform that occur in one second? [2E-12-3.1]
A. Pulse repetition rate
B. Hertz
C. Frequency per wavelength
D. Frequency

258. A certain AC signal makes 2000 complete cycles in one second. What property of the signal does this number describe? [2E-12-3.2]
A. The frequency of the signal
B. The pulse repetition rate of the signal
C. The wavelength of the signal
D. The hertz per second of the signal

259. What is the basic unit of frequency? [2E-12-3.3]
A. The hertz
B. The cycle
C. The kilohertz
D. The megahertz

260. What range of frequencies are usually called audio frequencies? [2E-12-4.1]
A. 0 to 20 Hz
B. 20 to 20,000 Hz
C. 200 to 200,000 Hz
D. 10,000 to 30,000 Hz

261. A signal at 725 Hz is in what frequency range? [2E-12-4.2]
A. Audio frequency
B. Intermediate frequency
C. Microwave frequency
D. Radio frequency

262. Why do we call signals in the range 20 Hz to 20,000 Hz audio frequencies? [2E-12-4.3]
A. Because the human ear rejects signals in this frequency range
B. Because the human ear responds to sounds in this frequency range
C. Because frequencies in this range are too low for a radio to detect
D. Because a radio converts signals in this range directly to sounds the human ear responds to

263. Signals above what frequency are usually called radio-frequency signals? [2E-12-5.1]
A. 20 Hz
B. 2000 Hz
C. 20,000 Hz
D. 1,000,000 Hz

264. A signal at 7125 kHz is in what frequency range? [2E-12-5.2]
A. Audio frequency
B. Radio frequency
C. Hyper-frequency
D. Super-high frequency

265. What is the term for the distance an AC signal travels during one complete cycle? [2E-13.1]
A. Wave velocity
B. Velocity factor
C. Wavelength
D. Wavelength per meter

266. In the time it takes a certain radio signal to pass your antenna, the leading edge of the wave travels 12 meters. What property of the signal does this number refer to? [2E-13.2]
A. The signal frequency
B. The wave velocity
C. The velocity factor
D. The signal wavelength

SUBELEMENT 2F - Circuit Components (2 Questions)

One (1) question should be from the following:

267. What is the symbol used on schematic diagrams to represent a resistor? (Please refer to Diagram 2F-1.1) [2F-1.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

268. What is the symbol used on schematic diagrams to represent a variable resistor or potentiometer? (Please refer to Diagram 2F-1.2) [2F-1.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

269. In Diagram 2F-1, which component is a resistor? [2F-1.3]
A. 1
B. 2
C. 3
D. 4

270. What is the symbol used on schematic diagrams to represent a single-pole, single-throw switch? (Please refer to Diagram 2F-2.1) [2F-2.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

271. What is the symbol used on schematic diagrams to represent a single-pole, double-throw switch? (Please refer to Diagram 2F-2.2) [2F-2.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

272. What is the symbol used on schematic diagrams to represent a double-pole, double-throw switch? (Please refer to Diagram 2F-2.3) [2F-2.3]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

273. What is the symbol used on schematic diagrams to represent a single-pole 5-position switch? (Please refer to Diagram 2F-2.4) [2F-2.4]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

274. In Diagram 2F-2, which component is a switch? [2F-2.5]
A. 1
B. 2
C. 3
D. 4

275. What is the symbol used on schematic diagrams to represent a fuse? (Please refer to Diagram 2F-3.1) [2F-3.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

276. What is the symbol used on schematic diagrams to represent a single-cell battery? (Please refer to Diagram 2F-4.1) [2F-4.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

277. What is the symbol used on schematic diagrams to represent a multiple-cell battery? (Please refer to Diagram 2F-4.2) [2F-4.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

One (1) question should be from the following:

278. What is the symbol normally used to represent an earth-ground connection on schematic diagrams? (Please refer to Diagram 2F-5.1) [2F-5.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

279. What is the symbol normally used to represent a chassis-ground connection on schematic diagrams? (Please refer to Diagram 2F-5.2) [2F-5.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

280. In Diagram 2F-5, which symbol represents a chassis ground connection? [2F-5.3]
A. 1
B. 2
C. 3
D. 4

281. In Diagram 2F-5, which symbol represents an earth ground connection? [2F-5.4]
A. 1
B. 2
C. 3
D. 4

282. What is the symbol used to represent an antenna on schematic diagrams? (Please refer to Diagram 2F-6.1) [2F-6.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

283. What is the symbol used to represent an NPN bipolar transistor on schematic diagrams? (Please refer to Diagram 2F-7.1) [2F-7.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

284. What is the symbol used to represent a PNP bipolar transistor on schematic diagrams? (Please refer to Diagram 2F-7.2) [2F-7.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

285. In Diagram 2F-7, which symbol represents a PNP bipolar transistor? [2F-7.3]
A. 1
B. 2
C. 3
D. 4

286. In Diagram 2F-7, which symbol represents an NPN bipolar transistor? [2F-7.4]
A. 1
B. 2
C. 3
D. 4

287. What is the symbol used to represent a triode vacuum tube on schematic diagrams? (Please refer to Diagram 2F-8.1) [2F-8.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

SUBELEMENT 2G - Practical Circuits (2 Questions)

One (1) question should be from the following:

288. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-1.1) [2G-1-1.1]
A. A terminal-node controller
B. An antenna switch
C. A telegraph key
D. A TR switch

289. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-1.2) [2G-1-1.2]
A. A microphone
B. A receiver
C. A transmitter
D. An SWR meter

290. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-1.3) [2G-1-1.3]
A. A key click filter
B. An antenna tuner
C. A power supply
D. A receiver

291. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-1.4) [2G-1-1.4]
A. A transceiver
B. A TR switch
C. An antenna tuner
D. A modem

292. In block diagram 2G-1, which symbol represents an antenna? [2G-1-1.5]
A. 1
B. 2
C. 3
D. 4

293. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-2.1) [2G-1-2.1]
A. A pi network
B. An antenna switch
C. A key click filter
D. A mixer

294. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-2.2) [2G-1-2.2]
A. A TR switch
B. A variable frequency oscillator
C. A linear amplifier
D. A microphone

295. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-1-2.3) [2G-1-2.3]
A. An antenna switch
B. An impedance-matching network
C. A key click filter
D. A terminal-node controller

296. In block diagram 2G-1, if component 1 is a transceiver and component 2 is an SWR meter, what is component 3? [2G-1-2.4]
A. A power supply
B. A receiver
C. A microphone
D. An impedance matching device

297. In block diagram 2G-1, if component 2 is an SWR meter and component 3 is an impedance matching device, what is component 1? [2G-1-2.5]
A. A power supply
B. An antenna
C. An antenna switch
D. A transceiver

One (1) question should be from the following:

298. In an amateur station designed for Morse radiotelegraph operation, what station accessory will you need to go with your transmitter? [2G-2.1]
A. A terminal-node controller
B. A telegraph key
C. An SWR meter
D. An antenna switch

299. What is the unlabeled block (?) in this diagram of a Morse telegraphy station? (Please refer to Diagram 2G-2.2) [2G-2.2]
A. A sidetone oscillator
B. A microphone
C. A telegraph key
D. A DTMF keypad

300. What station accessory do many amateurs use to help form good Morse code characters? [2G-2.3]
A. A sidetone oscillator
B. A key-click filter
C. An electronic keyer
D. A DTMF keypad

301. In an amateur station designed for radiotelephone operation, what station accessory will you need to go with your transmitter? [2G-3.1]
A. A splatter filter
B. A terminal-voice controller
C. A receiver audio filter
D. A microphone

302. What is the unlabeled block (?) in this diagram of a radiotelephone station? (Please refer to Diagram 2G-3.2) [2G-3.2]
A. A splatter filter
B. A terminal-voice controller
C. A receiver audio filter
D. A microphone

303. In an amateur station designed for radioteletype operation, what station accessories will you need to go with your transmitter? [2G-4.1]
A. A modem and a teleprinter or computer system
B. A computer, a printer and a RTTY refresh unit
C. A terminal-node controller
D. A modem, a monitor and a DTMF keypad

304. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 2G-4.2) [2G-4.2]
A. An RS-232 interface
B. SWR bridge
C. Modem
D. Terminal-network controller

305. In a packet-radio station, what device connects between the radio transceiver and the computer terminal? [2G-5.1]
A. A terminal-node controller
B. An RS-232 interface
C. A terminal refresh unit
D. A tactical network control system

306. What is the unlabeled block (?) in this diagram of a packet-radio station? (Please refer to Diagram 2G-5.2) [2G-5.2]
A. A terminal-node controller
B. An RS-232 interface
C. A terminal refresh unit
D. A tactical network control system

307. Where does a terminal-node controller connect in an amateur packet-radio station? [2G-5.3]
A. Between the antenna and the radio
B. Between the computer and the monitor
C. Between the computer or terminal and the radio
D. Between the keyboard and the computer

SUBELEMENT 2H - Signals and Emissions (2 Questions)

One (1) question should be from the following:

308. What keying method is used to transmit CW? [2H-1-1.1]
A. Frequency-shift keying of a radio-frequency signal
B. On/off keying of a radio-frequency signal
C. Audio-frequency-shift keying of an oscillator tone
D. On/off keying of an audio-frequency signal

309. What emission type describes international Morse code telegraphy messages? [2H-1-1.2]
A. RTTY
B. Image
C. CW
D. Phone

310. What emission type describes narrow-band direct-printing telegraphy emissions? [2H-1-2.1]
A. RTTY
B. Image
C. CW
D. Phone

311. What keying method is used to transmit RTTY messages? [2H-1-2.2]
A. Frequency-shift keying of a radio-frequency signal
B. On/off keying of a radio-frequency signal
C. Digital pulse-code keying of an unmodulated carrier
D. On/off keying of an audio-frequency signal

312. What emission type describes frequency-modulated voice transmissions? [2H-1-3.1]
A. FM phone
B. Image
C. CW
D. Single-sideband phone

313. What emission type describes single-sideband suppressed-carrier (SSB) voice transmissions? [2H-1-4.1]
A. FM phone
B. Image
C. CW
D. Sideband phone

314. What does the term key click mean? [2H-2.1]
A. The mechanical noise caused by closing a straight key too hard
B. The clicking noise from an excessively square CW keyed waveform
C. The sound produced in a receiver from a CW signal faster than 20 WPM
D. The sound of a CW signal being copied on an AM receiver

315. How can key clicks be eliminated? [2H-2.2]
A. By reducing your keying speed to less than 20 WPM
B. By increasing power to the maximum allowable level
C. By using a power supply with better regulation
D. By using a key-click filter

316. What does the term chirp mean? [2H-3.1]
A. A distortion in the receiver audio circuits
B. A high-pitched audio tone transmitted with a CW signal
C. A slight shift in oscillator frequency each time a CW transmitter is keyed
D. A slow change in transmitter frequency as the circuit warms up

317. What can be done to the power supply of a CW transmitter to avoid chirp? [2H-3.2]
A. Resonate the power supply filters
B. Regulate the power supply output voltages
C. Use a buffer amplifier between the transmitter output and the feed line
D. Hold the power supply current to a fixed value

318. What is a common cause of superimposed hum? [2H-4.1]
A. Using a nonresonant random-wire antenna
B. Sympathetic vibrations from a nearby transmitter
C. Improper neutralization of the transmitter output stage
D. A defective filter capacitor in the power supply

319. What type of problem can a bad power-supply filter capacitor cause in a transmitter or receiver? [2H-4.2]
A. Sympathetic vibrations in nearby receivers
B. A superimposed hum or buzzing sound
C. Extreme changes in antenna resonance
D. Imbalance in the mixers

One (1) question should be from the following:

320. What is the 4th harmonic of a 7160-kHz signal? [2H-5.1]
A. 28,640 kHz
B. 35,800 kHz
C. 28,160 kHz
D. 1790 kHz

321. You receive an FCC Notice of Violation stating that your station was heard on 21,375 kHz. At the time listed on the notice, you were operating on 7125 kHz. What is a possible cause of this violation? [2H-5.2]
A. Your transmitter has a defective power-supply filter capacitor
B. Your CW keying speed was excessively fast
C. Your transmitter was radiating excess harmonic signals
D. Your transmitter has a defective power-supply filter choke

322. What may happen to body tissues that are exposed to large amounts of UHF or microwave RF energy? [2H-6.1]
A. The tissue may be damaged because of the heat produced
B. The tissue may suddenly be frozen
C. The tissue may be immediately destroyed because of the Maxwell Effect
D. The tissue may become less resistant to cosmic radiation

323. What precaution should you take before working near a high-gain UHF or microwave antenna (such as a parabolic, or dish antenna)? [2H-6.2]
A. Be certain the antenna is FCC type accepted
B. Be certain the antenna and transmitter are properly grounded
C. Be certain the transmitter cannot be operated
D. Be certain the antenna safety interlocks are in place

324. You are installing a VHF or UHF mobile radio in your vehicle. What is the best location to mount the antenna on the vehicle to minimize any danger from RF exposure to the driver or passengers? [2H-6.3]
A. In the middle of the roof
B. Along the top of the windshield
C. On either front fender
D. On the trunk lid

325. You discover that your tube-type transmitter power amplifier is radiating spurious emissions. What is the most likely cause of this problem? [2H-7.1]
A. Excessively fast keying speed
B. Undermodulation
C. Improper neutralization
D. Tank-circuit current dip at resonance

326. Your transmitter radiates signals outside the amateur band where you are transmitting. What term describes this radiation? [2H-7.2]
A. Off-frequency emissions
B. Transmitter chirp
C. Incidental radiation
D. Spurious emissions

327. What problem can occur if you operate your transmitter without the cover and other shielding in place? [2H-7.3]
A. Your transmitter can radiate spurious emissions
B. Your transmitter may radiate a "chirpy" signal
C. The final amplifier efficiency of your transmitter may decrease
D. You may cause splatter interference to other stations operating on nearby frequencies

328. What type of interference will you cause if you operate your SSB transmitter with the microphone gain adjusted too high? [2H-7.4]
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause splatter interference to other stations operating on nearby frequencies
C. You may cause atmospheric interference in the air around your antenna
D. You may cause processor interference to the microprocessor in your rig

329. What may happen if you adjust the microphone gain or deviation control on your FM transmitter too high? [2H-7.5]
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause interference to other stations operating on nearby frequencies
C. You may cause atmospheric interference in the air around your antenna
D. You may cause processor interference to the microprocessor in your rig

330. What type of interference can excessive amounts of speech processing in your SSB transmitter cause? [2H-7.6]
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause splatter interference to other stations operating on nearby frequencies
C. You may cause atmospheric interference in the air around your antenna
D. You may cause processor interference to the microprocessor in your rig

SUBELEMENT 2I - Antennas and Feed Lines (3 Questions)

One (1) question should be from the following:

331. What is the approximate length (in feet) of a half-wavelength dipole antenna for 3725 kHz? [2I-1.1]
A. 126 ft
B. 81 ft
C. 63 ft
D. 40 ft

332. What is the approximate length (in feet) of a half-wavelength dipole antenna for 7125 kHz? [2I-1.2]
A. 84 ft
B. 42 ft
C. 33 ft
D. 66 ft

333. What is the approximate length (in feet) of a half-wavelength dipole antenna for 21,125 kHz? [2I-1.3]
A. 44 ft
B. 28 ft
C. 22 ft
D. 14 ft

334. What is the approximate length (in feet) of a half-wavelength dipole antenna for 28,150 kHz? [2I-1.4]
A. 22 ft
B. 11 ft
C. 17 ft
D. 34 ft

335. How is the approximate length (in feet) of a half-wavelength dipole antenna calculated? [2I-1.5]
A. By substituting the desired operating frequency for f in the formula: 150 / f (in MHz)
B. By substituting the desired operating frequency for f in the formula: 234 / f (in MHz)
C. By substituting the desired operating frequency for f in the formula: 300 / f (in MHz)
D. By substituting the desired operating frequency for f in the formula: 468 / f (in MHz)

336. What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 3725 kHz? [2I-2.1]
A. 20 ft
B. 32 ft
C. 40 ft
D. 63 ft

337. What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 7125 kHz? [2I-2.2]
A. 11 ft
B. 16 ft
C. 21 ft
D. 33 ft

338. What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 21,125 kHz? [2I-2.3]
A. 7 ft
B. 11 ft
C. 14 ft
D. 22 ft

339. What is the approximate length (in feet) of a quarter-wavelength vertical antenna for 28,150 kHz? [2I-2.4]
A. 5 ft
B. 8 ft
C. 11 ft
D. 17 ft

340. When a vertical antenna is lengthened, what happens to its resonant frequency? [2I-2.5]
A. It decreases
B. It increases
C. It stays the same
D. It doubles

341. Why do many amateurs use a 5/8-wavelength vertical antenna rather than a 1/4-wavelength vertical antenna for their VHF or UHF mobile stations? [2I-3.1]
A. A 5/8-wavelength antenna can handle more power than a 1/4-wavelength antenna
B. A 5/8-wavelength antenna has more gain than a 1/4-wavelength antenna
C. A 5/8-wavelength antenna exhibits less corona loss than a 1/4-wavelength antenna
D. A 5/8-wavelength antenna looks more like a CB antenna, so it does not attract as much attention as a 1/4-wavelength antenna

342. What type of radiation pattern is produced by a 5/8-wavelength vertical antenna? [2I-3.2]
A. A pattern with most of the transmitted signal concentrated in two opposite directions
B. A pattern with the transmitted signal going equally in all compass directions, with most of the radiation going high above the horizon
C. A pattern with the transmitted signal going equally in all compass directions, with most of the radiation going close to the horizon
D. A pattern with more of the transmitted signal concentrated in one direction than in other directions

One (1) question should be from the following:

343. What type of antenna produces a radiation pattern with more of the transmitted signal concentrated in a particular direction than in other directions? [2I-4-1.1]
A. A dipole antenna
B. A vertical antenna
C. An isotropic antenna
D. A beam antenna

344. What type of radiation pattern is produced by a Yagi antenna? [2I-4-1.2]
A. A pattern with the transmitted signal spread out equally in all compass directions
B. A pattern with more of the transmitted signal concentrated in one direction than in other directions
C. A pattern with most of the transmitted signal concentrated in two opposite directions
D. A pattern with most of the transmitted signal concentrated at high radiation angles

345. Approximately how long (in wavelengths) is the driven element of a Yagi antenna? [2I-4-1.3]
A. 1/4 wavelength
B. 1/3 wavelength
C. 1/2 wavelength
D. 1 wavelength

346. On the Yagi antenna shown in Figure 2I-4, what is the name of section B? [2I-4-2.1]
A. Director
B. Reflector
C. Boom
D. Driven element

347. On the Yagi antenna shown in Figure 2I-4, what is the name of section C? [2I-4-2.2]
A. Director
B. Reflector
C. Boom
D. Driven element

348. On the Yagi antenna shown in Figure 2I-4, what is the name of section A? [2I-4-2.3]
A. Director
B. Reflector
C. Boom
D. Driven element

349. What are the names of the elements in a 3-element Yagi antenna? [2I-4-2.4]
A. Reflector, driven element and director
B. Boom, mast and reflector
C. Reflector, base and radiator
D. Driven element, trap and feed line

350. How should the antenna on a hand-held transceiver be positioned while you are transmitting? [2I-5.1]
A. Away from your head and away from others standing nearby
B. Pointed in the general direction of the repeater or other station you are transmitting to
C. Pointed in a general direction 90 degrees away from the repeater or other station you are transmitting to
D. With the top of the antenna angled down slightly to take the most advantage of ground reflections

351. Why should you always locate your antennas so that no one can come in contact with them while you are transmitting? [2I-5.2]
A. Such contact can detune the antenna, causing television interference
B. To prevent RF burns and excessive exposure to RF energy
C. The antenna is more likely to radiate harmonics when it is touched
D. Such contact may reflect the transmitted signal back to the transmitter, damaging the final amplifier

352. You are going to purchase a new antenna for your VHF or UHF hand-held radio. Which type of antenna is the best choice to produce a radiation pattern that will be least hazardous to your face and eyes? [2I-5.3]
A. A 1/8-wavelength whip
B. A 7/8-wavelength whip
C. A 1/2-wavelength whip
D. A short, helically wound, flexible antenna

One (1) question should be from the following:

353. What is a coaxial cable? [2I-6.1]
A. Two parallel conductors encased along the edges of a flat plastic ribbon
B. Two parallel conductors held at a fixed distance from each other by insulating rods
C. Two conductors twisted around each other in a double spiral
D. A center conductor encased in insulating material which is covered by a conducting sleeve or shield

354. What kind of antenna feed line is constructed of a center conductor encased in insulation which is then covered by an outer conducting shield and weatherproof jacket? [2I-6.2]
A. Twin lead
B. Coaxial cable
C. Open-wire feed line
D. Wave guide

355. What are some advantages of using coaxial cable as an antenna feed line? [2I-6.3]
A. It is easy to make at home, and it has a characteristic impedance in the range of most common amateur antennas
B. It is weatherproof, and it has a characteristic impedance in the range of most common amateur antennas
C. It can be operated at a higher SWR than twin lead, and it is weatherproof
D. It is unaffected by nearby metallic objects, and has a characteristic impedance that is higher than twin lead

356. What commonly-available antenna feed line can be buried directly in the ground for some distance without adverse effects? [2I-6.4]
A. Twin lead
B. Coaxial cable
C. Parallel conductor
D. Twisted pair

357. When an antenna feed line must be located near grounded metal objects, which commonly-available feed line should be used? [2I-6.5]
A. Twisted pair
B. Twin lead
C. Coaxial cable
D. Ladder-line

358. What is parallel-conductor feed line? [2I-7.1]
A. Two conductors twisted around each other in a double spiral
B. Two parallel conductors held a uniform distance apart by insulating material
C. A conductor encased in insulating material which is then covered by a conducting shield and a weatherproof jacket
D. A metallic pipe whose diameter is equal to or slightly greater than the wavelength of the signal being carried

359. How can TV-type twin lead be used as a feed line? [2I-7.2]
A. By carefully running the feed line parallel to a metal post to ensure self resonance
B. TV-type twin lead cannot be used in an amateur station
C. By installing an impedance-matching network between the transmitter and feed line
D. By using a high-power amplifier and installing a power attenuator between the transmitter and feed line

360. What are some advantages of using parallel-conductor feed line? [2I-7.3]
A. It has a lower characteristic impedance than coaxial cable, and will operate at a higher SWR than coaxial cable
B. It will operate at a higher SWR than coaxial cable, and it is unaffected by nearby metal objects
C. It has a lower characteristic impedance than coaxial cable, and has less loss than coaxial cable
D. It will operate at higher SWR than coaxial cable and it has less loss than coaxial cable

361. What are some disadvantages of using parallel-conductor feed line? [2I-7.4]
A. It is affected by nearby metallic objects, and it has a characteristic impedance that is too high for direct connection to most amateur transmitters
B. It is more difficult to make at home than coaxial cable and it cannot be operated at a high SWR
C. It is affected by nearby metallic objects, and it cannot handle the power output of a typical amateur transmitter
D. It has a characteristic impedance that is too high for direct connection to most amateur transmitters, and it will operate at a high SWR

362. What kind of antenna feed line is constructed of two conductors maintained a uniform distance apart by insulated spreaders? [2I-7.5]
A. Coaxial cable
B. Ladder-line open conductor line
C. Twin lead in a plastic ribbon
D. Twisted pair

363. A certain antenna has a feed-point impedance of 35 ohms. You want to use a 50-ohm-impedance coaxial cable to feed this antenna. What type of device will you need to connect between the antenna and the feed line? [2I-8.1]
A. A balun
B. An SWR bridge
C. An impedance matching device
D. A low-pass filter

364. A certain antenna system has an impedance of 1000 ohms on one band. What must you use to connect this antenna system to the 50-ohm output on your transmitter? [2I-8.2]
A. A balun
B. An SWR bridge
C. An impedance matching device
D. A low-pass filter

365. The word balun is a contraction for what phrase? [2I-9.1]
A. Balanced-antenna-lobe use network
B. Broadband-amplifier linearly unregulated
C. Balanced unmodulator
D. Balanced to unbalanced

366. Where would you install a balun if you wanted to feed your dipole antenna with 450-ohm parallel-conductor feed line? [2I-9.2]
A. At the transmitter end of the feed line
B. At the antenna feed point
C. In only one conductor of the feed line
D. From one conductor of the feed line to ground

367. Where might you install a balun if you wanted to feed your dipole antenna with 50-ohm coaxial cable? [2I-9.3]
A. You might install a balun at the antenna feed point
B. You might install a balun at the transmitter output
C. You might install a balun 1/2 wavelength from the transmitter
D. You might install baluns in the middle of each side of the dipole

368. A four-element Yagi antenna is mounted with its elements parallel to the ground. A signal produced by this antenna will have what type of polarization? [2I-10-1.1]
A. Broadside polarization
B. Circular polarization
C. Horizontal polarization
D. Vertical polarization

369. A four-element Yagi antenna is mounted with its elements perpendicular to the ground. A signal produced by this antenna will have what type of polarization? [2I-11-1.1]
A. Broadside polarization
B. Circular polarization
C. Horizontal polarization
D. Vertical polarization

A. B.

C. D.

Diagram 2F-1.1

A. B.

C. D.

Diagram 2F-1.2

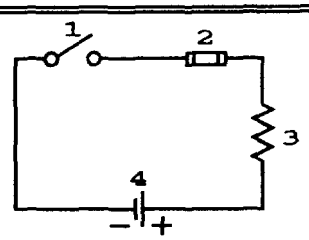

Diagram 2F-1

A. B.

C. D.

Diagram 2F-2.1

A. B.

C. D.

Diagram 2F-2.2

A. B.

C. D.

Diagram 2F-2.3

A. B.

C. D.

Diagram 2F-2.4

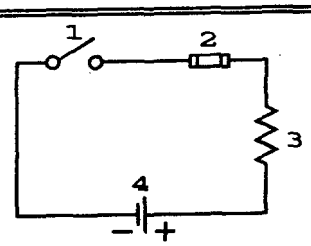

Diagram 2F-2

A. B.

C. D.

Diagram 2F-3.1

A. B.

C. D.

Diagram 2F-4.1

A. B.

C. D.

Diagram 2F-4.2

A. B.

C. D.

Diagram 2F-5.1

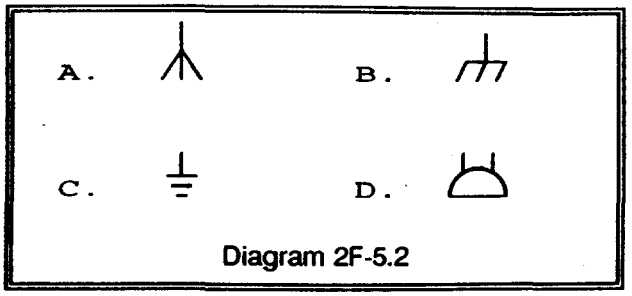

Diagram 2F-5.2

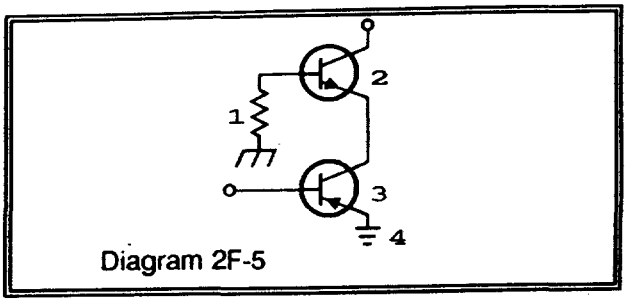

Diagram 2F-5

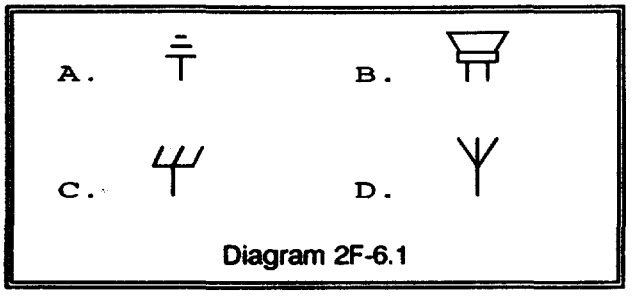

Diagram 2F-6.1

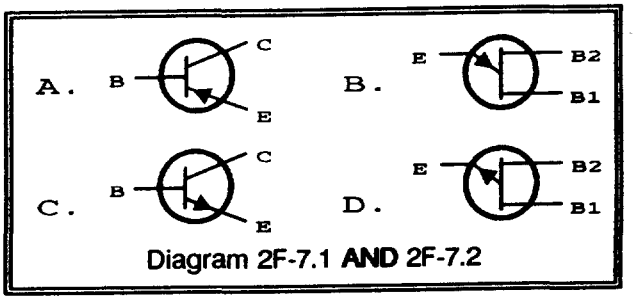

Diagram 2F-7.1 **AND** 2F-7.2

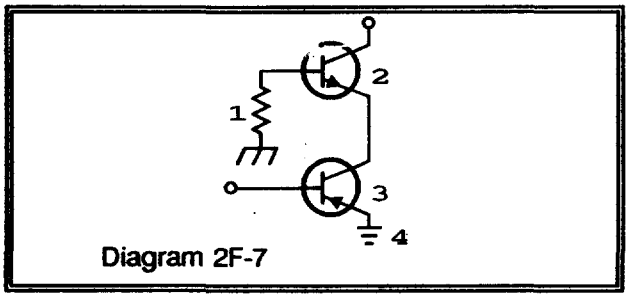

Diagram 2F-7

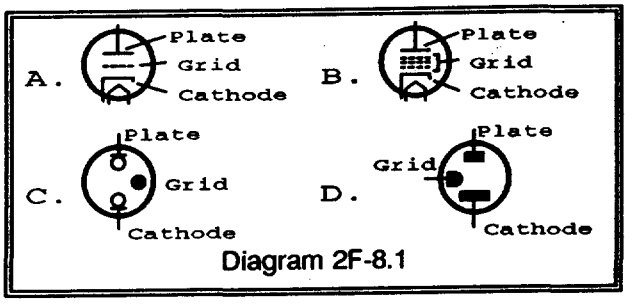

Diagram 2F-8.1

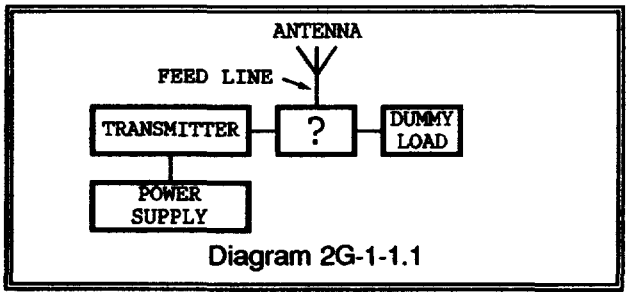

Diagram 2G-1-1.1

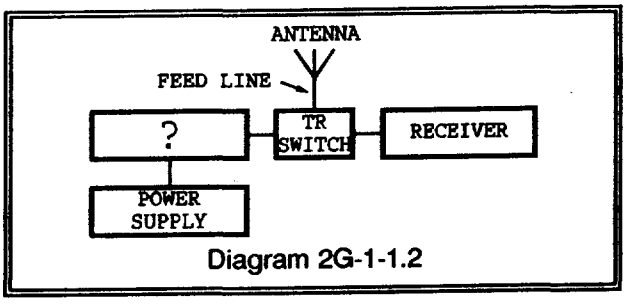

Diagram 2G-1-1.2

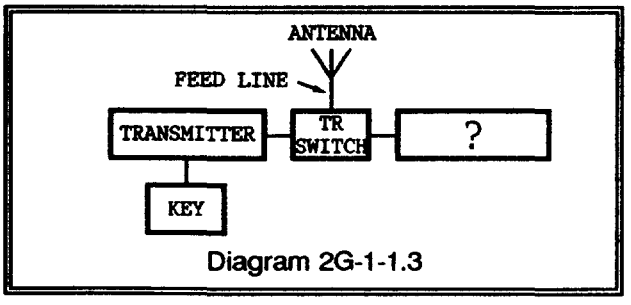

Diagram 2G-1-1.3

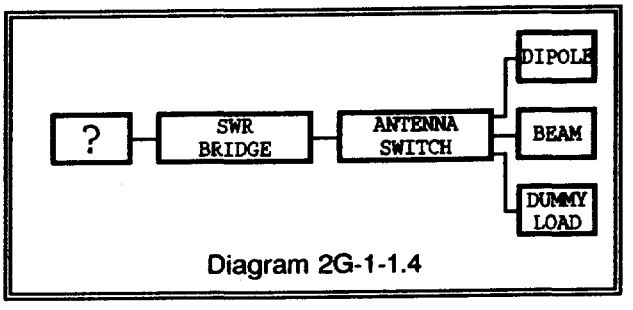

Diagram 2G-1-1.4

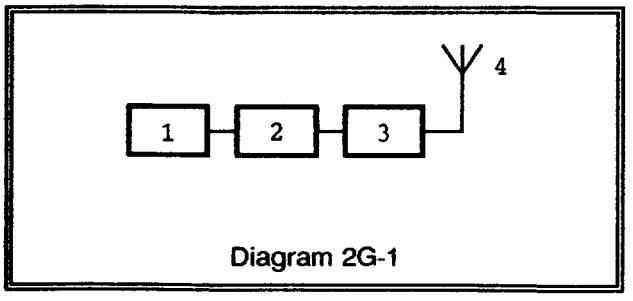

Diagram 2G-1

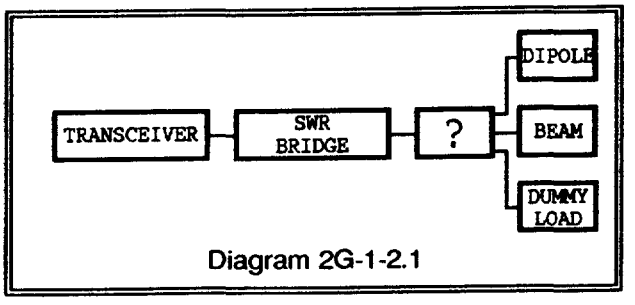

Diagram 2G-1-2.1

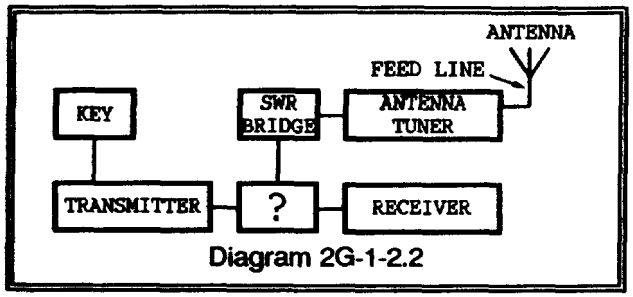

Diagram 2G-1-2.2

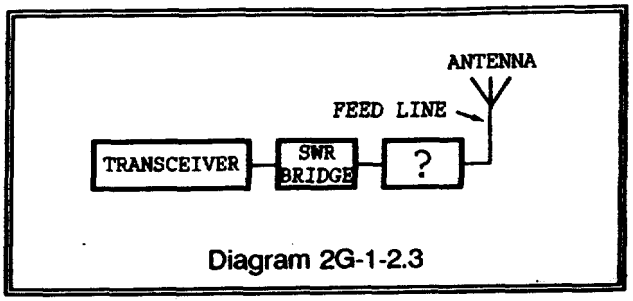

Diagram 2G-1-2.3

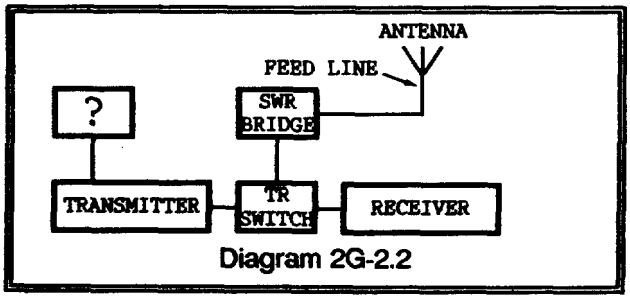

Diagram 2G-2.2

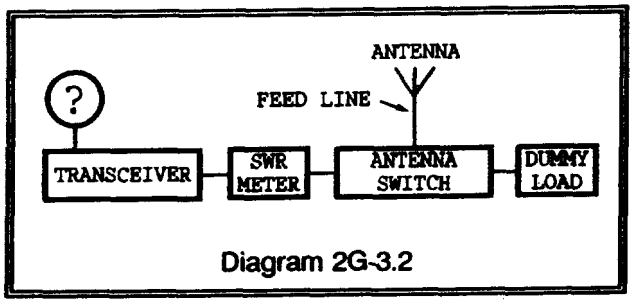

Diagram 2G-3.2

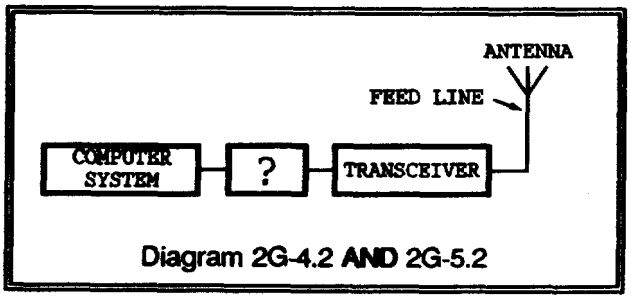

Diagram 2G-4.2 **AND** 2G-5.2

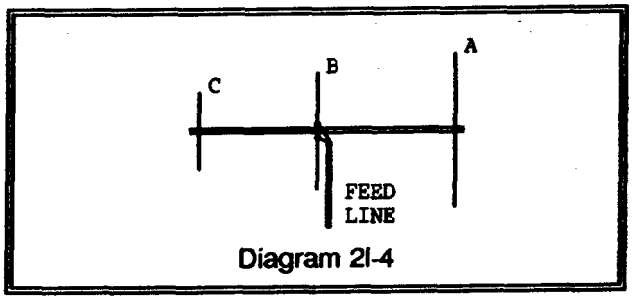

Diagram 2I-4

1. A [2A-1.1]
2. D [2A-1.2]
3. D [2A-1.3]
4. B [2A-1.4]
5. C [2A-2.1]
6. A [2A-2.2]
7. A [2A-3.1]
8. D [2A-3.2]
9. B [2A-4.1]
10. D [2A-4.2]
11. C [2A-5.1]
12. B [2A-5.2]
13. B [2A-6.1]
14. C [2A-6.2]
15. D [2A-7.1]
16. A [2A-8.1]
17. D [2A-8.2]
18. D [2A-9.1]
19. B [2A-9.3]
20. C [2A-10.2]
21. A [2A-10.3]
22. C [2A-10.4]
23. B [2A-10.5]
24. C [2A-10.6]
25. A [2A-10.7]
26. B [2A-10.8]
27. C [2A-10.9]
28. D [2A-10.10]
29. A [2A-11.1]
30. B [2A-11.2]
31. C [2A-12.1]
32. A [2A-12.2]
33. D [2A-12.3]
34. A [2A-13.1]
35. B [2A-14.1]
36. C [2A-15.1]
37. D [2A-15.2]
38. A [2A-15.3]
39. B [2A-15.4]
40. D [2A-15.5]
41. A [2A-16.1]
42. A [2A-17.1]
43. A [2A-17.2]
44. A [2A-17.3]
45. A [2A-17.4]
46. D [2A-17.6]
47. D [2A-17.7]
48. C [2A-17.8]
49. C [2A-17.9]
50. D [2A-17.10]
51. D [2A-17.11]
52. D [2A-17.12]
53. C [2A-17.13]
54. D [2A-18.1]
55. C [2A-18.2]
56. C [2A-18.3]
57. C [2A-18.4]
58. C [2A-18.5]
59. C [2A-19.1]
60. B [2A-19.2]
61. C [2A-19.3]
62. D [2A-19.4]
63. B [2A-19.5]
64. C [2A-20.1]
65. C [2A-20.2]
66. D [2A-20.3]
67. C [2A-21.1]
68. A [2A-21.2]
69. D [2A-21.3]
70. B [2A-21.4]
71. C [2A-22.1]
72. A [2A-22.2]
73. B [2A-23.1]
74. B [2A-24.1]
75. C [2A-25.1]
76. D [2A-26.1]
77. C [2A-27.1]
78. B [2A-27.2]
79. B [2A-27.3]
80. A [2A-27.4]
81. B [2A-27.5]
82. C [2A-27.6]
83. B [2A-27.7]
84. D [2A-28.1]
85. C [2A-28.2]
86. B [2A-29.1]
87. D [2A-29.2]
88. A [2A-30.1]
89. B [2A-30.2]
90. D [2A-30.3]
91. D [2A-31.1]
92. A [2A-32.1]
93. D [2A-32.2]
94. A [2A-33.1]
95. A [2A-34.1]
96. B [2A-34.2]
97. D [2A-34.3]
98. A [2A-35.1]
99. C [2A-36.1]
100. D [2A-36.2]
101. A [2A-37.1]
102. C [2A-37.2]
103. C [2A-38.1]
104. D [2A-38.2]
105. A [2A-38.3]
106. C [2A-39.1]
107. B [2A-39.2]
108. B [2A-39.3]
109. C [2A-40.1]
110. D [2A-40.2]
111. D [2A-40.3]
112. A [2B-1-1.1]
113. C [2B-1-1.2]
114. C [2B-1-1.3]
115. D [2B-1-2.1]
116. A [2B-2-1.1]
117. B [2B-2-1.2]
118. C [2B-2-2.1]
119. C [2B-2-3.1]
120. D [2B-2-3.2]
121. A [2B-2-3.3]
122. B [2B-2-3.4]
123. C [2B-2-3.5]
124. D [2B-2-4.1]
125. A [2B-2-4.2]
126. A [2B-2-4.3]
127. D [2B-2-5.1]
128. B [2B-2-5.2]
129. A [2B-2-5.3]
130. B [2B-2-6.1]
131. C [2B-2-6.2]
132. D [2B-2-6.3]
133. A [2B-2-6.4]
134. B [2B-2-6.5]
135. C [2B-3-1.1]
136. D [2B-3-1.2]
137. A [2B-3-2.1]
138. C [2B-3-2.2]
139. A [2B-3-2.3]
140. D [2B-3-2.4]
141. A [2B-3-2.5]
142. C [2B-3-2.6]
143. A [2B-3-2.7]
144. D [2B-3-2.8]
145. B [2B-3-2.9]
146. A [2B-3-2.10]
147. C [2B-3-2.11]
148. B [2B-4-1.1]
149. B [2B-4-2.1]
150. C [2B-5-1.1]
151. D [2B-5-1.2]
152. A [2B-5-2.1]
153. B [2B-5-2.2]
154. C [2B-6-1.1]
155. D [2B-6-2.1]
156. A [2B-6-3.1]
157. B [2B-6-4.1]
158. C [2B-6-5.1]
159. D [2B-6-5.2]
160. A [2C-1.1]
161. B [2C-1.2]
162. D [2C-2.1]
163. B [2C-2.2]
164. B [2C-2.3]
165. A [2C-2.4]
166. A [2C-3.1]
167. B [2C-3.2]
168. D [2C-3.3]
169. A [2C-3.4]
170. C [2C-3.5]
171. D [2C-3.6]
172. C [2C-4.1]
173. D [2C-4.2]
174. A [2C-5.1]
175. B [2C-5.2]
176. C [2C-6.1]
177. C [2C-6.2]
178. B [2D-1.1]
179. A [2D-1.2]
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181. C [2D-2.2]
182. D [2D-2.3]
183. B [2D-2.4]
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186. B [2D-3.3]

187. C [2D-3.4]
188. B [2D-4.1]
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193. B [2D-4.6]
194. D [2D-5.1]
195. A [2D-5.2]
196. D [2D-6.1]
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218. C [2D-8-2.4]
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351. B [2I-5.2]
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355. B [2I-6.3]
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ATTACHMENT 2

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The Radio Amateur's

ELEMENT 3(A)

Technician Class Test Manual

Contains all questions & answers in the Technician Class VEC Question Pool

Updated for the new Codeless Technician rules

All accredited Volunteer Examiners (VE's) and Volunteer Examiner Coordinator (VEC) organizations are required to use these Technician Class questions verbatim in preparing their Element 3(A) examinations. These test questions were released into the public domain by the VEC organizations' Question Pool Committee on July 1, 1990. The purpose of this test manual is to alert the public to the content of the Element 3(A) question pool. It is not a study guide since no explanations of the answers are included.

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SUBELEMENT 3AA - Commission's Rules (5 Questions)

1. What is the control point of an amateur station? [3AA-1.1]
   A. The location at which the control operator function is performed
   B. The operating position of any Amateur Radio station operating as a repeater user station
   C. The physical location of any Amateur Radio transmitter, even if it is operated by radio link from some other location
   D. The variable frequency oscillator (VFO) of the transmitter

2. What is the term for the location at which the control operator function is performed? [3AA-1.2]
   A. The operating desk
   B. The control point
   C. The station location
   D. The manual control location

3. Which operator licenses authorize privileges on 52.525 MHz? [3AA-2.2]
   A. Extra, Advanced only
   B. Extra, Advanced, General only
   C. Extra, Advanced, General, Technician only
   D. Extra, Advanced, General, Technician, Novice

4. Which operator licenses authorize privileges on 146.52 MHz? [3AA-2.3]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

5. Which operator licenses authorize privileges on 223.50 MHz? [3AA-2.4]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

6. Which operator licenses authorize privileges on 446.0 MHz? [3AA-2.5]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

7. How often do amateur service licenses generally need to be renewed? [3AA-3.1]
   A. Every 10 years
   B. Every 5 years
   C. Every 2 years
   D. They are lifetime licenses

8. The FCC currently issues amateur licenses carrying 10-year terms. What is the "grace period" during which the FCC will renew an expired 10-year license? [3AA-3.2]
   A. 2 years
   B. 5 years
   C. 10 years
   D. There is no grace period

9. What action would you take to modify your operator/primary station license? [3AA-3.3]
   A. Properly fill out FCC Form 610 and send it to the FCC in Gettysburg, PA
   B. Properly fill out FCC Form 610 and send it to the nearest FCC field office
   C. Write the FCC at their nearest field office
   D. There is no need to modify an amateur license between renewals

10. On what frequencies within the 6-meter wavelength band may FM phone emissions be transmitted? [3AA-4.1]
   A. 50.0-54.0 MHz only
   B. 50.1-54.0 MHz only
   C. 51.0-54.0 MHz only
   D. 52.0-54.0 MHz only

11. On what frequencies within the 2-meter wavelength band may FM image emissions be transmitted? [3AA-4.2]
   A. 144.1-148.0 MHz only
   B. 146.0-148.0 MHz only
   C. 144.0-148.0 MHz only
   D. 146.0-147.0 MHz only

12. What emission type may always be used for station identification, regardless of the transmitting frequency? [3AA-4.3]
   A. CW
   B. RTTY
   C. MCW
   D. Phone

13. If you are using a frequency within a band designated to the amateur service on a secondary basis and another station assigned to a primary service on that band causes interference, what action should you take? [3AA-5.1]
   A. Notify the FCC's regional Engineer in Charge of the interference
   B. Increase your transmitter's power to overcome the interference
   C. Attempt to contact the station and request that it stop the interference
   D. Change frequencies; you may also be causing interference to the other station and that would be a violation of FCC rules

14. What is the basic principle of frequency sharing between two stations allocated to a primary service within a frequency band, but each in a different ITU Region or Subregion? [3AA-5.2]
A. The station with a control operator holding a lesser class of license must yield the frequency to the station with a control operator holding a higher class license
B. The station with a lower power output must yield the frequency to the station with a higher power output
C. Both stations have an equal right to operate on the frequency
D. Stations in ITU Regions 1 and 3 must yield the frequency to stations in ITU Region 2

15. FCC Rules specify the maximum transmitter power that you may use with your Amateur Radio station. At what point in your station is the transmitter power measured? [3AA-6-1.1]
A. By measuring the final amplifier supply voltage inside the transmitter or amplifier
B. By measuring the final amplifier supply current inside the transmitter or amplifier
C. At the antenna terminals of the transmitter or amplifier
D. On the antenna itself, after the feed line

16. What is the term used to define the average power supplied to the antenna transmission line during one RF cycle at the crest of the modulation envelope? [3AA-6-1.2]
A. Peak transmitter power
B. Peak output power
C. Average radio-frequency power
D. Peak envelope power

17. Notwithstanding the numerical limitations in the FCC Rules, how much transmitting power shall be used by an amateur station? [3AA-6-2.1]
A. There is no regulation other than the numerical limits
B. The minimum power level required to achieve S9 signal reports
C. The minimum power necessary to carry out the desired communication
D. The maximum power available, as long as it is under the allowable limit

18. What is the maximum transmitting power permitted an amateur station on 146.52 MHz? [3AA-6-3.1]
A. 200 watts PEP output
B. 500 watts ERP
C. 1000 watts DC input
D. 1500 watts PEP output

19. What is the maximum transmitting power permitted an amateur station in beacon operation? [3AA-6-4.1]
A. 10 watts PEP output
B. 100 watts PEP output
C. 500 watts PEP output
D. 1500 watts PEP output

20. What is the maximum sending speed permitted for a RTTY transmission between 28 and 50 MHz? [3AA-7-1.1]
A. 56 kilobauds
B. 19.6 kilobauds
C. 1200 bauds
D. 300 bauds

21. What is the maximum sending speed permitted for a RTTY transmission between 50 and 220 MHz? [3AA-7-1.2]
A. 56 kilobauds
B. 19.6 kilobauds
C. 1200 bauds
D. 300 bauds

22. What is the maximum sending speed permitted for a RTTY transmission above 220 MHz? [3AA-7-1.3]
A. 300 bauds
B. 1200 bauds
C. 19.6 kilobauds
D. 56 kilobauds

23. What is the maximum frequency shift permitted for RTTY when transmitted below 50 MHz? [3AA-7-2.1]
A. 100 Hz
B. 500 Hz
C. 1000 Hz
D. 5000 Hz

24. What is the maximum frequency shift permitted for RTTY when transmitted above 50 MHz? [3AA-7-2.2]
A. 100 Hz or the sending speed, in bauds, whichever is greater
B. 500 Hz or the sending speed, in bauds, whichever is greater
C. The FCC rules do not specify a maximum frequency shift above 50 MHz
D. 5000 Hz or the sending speed, in bauds, whichever is greater

25. What is the maximum authorized bandwidth of an RTTY, data or multiplexed emission using a specified digital code within the frequency range of 50 to 225 MHz? [3AA-7-3.1]
A. 20 kHz
B. 50 kHz
C. The total bandwidth shall not exceed that of a single-sideband emission
D. The total bandwidth shall not exceed 10 times that of a CW emission

26. What is the maximum authorized bandwidth of a RTTY, data or multiplexed emission using an unspecified digital code within the frequency range of 220 to 450 MHz? [3AA-7-3.2]
A. 50 kHz
B. 150 kHz
C. 200 kHz
D. 100 kHz

27. What is the maximum authorized bandwidth of an RTTY, data or multiplexed emission using an unspecified digital code within the 420 to 450 MHz amateur band? [3AA-7-3.3]
A. 50 kHz
B. 200 kHz
C. 300 kHz
D. 100 kHz

28. How must a control operator who has a Novice license and a Certificate of Successful Completion of Examination for Technician privileges identify the station when transmitting on 146.34 MHz? [3AA-8-1.1]
A. The new Technician may not operate on 146.34 until his or her new license arrives
B. The licensee gives his or her call sign, followed by any suitable word that denotes the slant mark and the identifier "KT"
C. No special form of identification is needed
D. The licensee gives his or her call sign and states the location of the VE examination where he or she obtained the certificate of successful completion

29. Which language(s) must be used when making the station identification by telephony? [3AA-8-2.1]
A. The language being used for the contact may be used if it is not English, providing the US has a third-party traffic agreement with that country
B. English must be used for identification
C. Any language may be used, if the country which uses that language is a member of the International Telecommunication Union
D. The language being used for the contact must be used for identification purposes

30. What does the FCC recommend to aid correct station identification when using phone? [3AA-8-3.1]
A. A speech compressor
B. Q signals
C. A recognized phonetic alphabet
D. Unique words of the operator's choice

31. What is the term used to describe an amateur station transmitting communications for the purpose of observation of propagation and reception or other related experimental activities? [3AA-9-1.1]
A. Beacon operation
B. Repeater operation
C. Auxiliary operation
D. Radio control operation

32. What class of amateur operator license must you hold to operate a beacon station? [3AA-9-2.1]
A. Technician, General, Advanced or Amateur Extra class
B. General, Advanced or Amateur Extra class
C. Amateur Extra class only
D. Any license class

33. What is the maximum transmitter power an amateur station is permitted when transmitting signals to control a model craft? [3AA-10.1]
A. One watt
B. One milliwatt
C. Two watts
D. Three watts

34. What minimum information must be indicated on the label affixed to a transmitter transmitting signals to control a model craft? [3AA-10.2]
A. Station call sign
B. Station call sign and operating times
C. Station call sign and the station licensee's name and address
D. Station call sign, class of license, and operating times

35. What are the station identification requirements for an amateur station transmitting signals to control a model craft? [3AA-10.3]
A. Once every ten minutes, and at the beginning and end of each transmission
B. Once every ten minutes
C. At the beginning and end of each transmission
D. Station identification is not required provided that a label indicating the station call sign and the station licensee's name and address is affixed to the station transmitter

36. Where must the writing indicating the station call sign and the licensee's name and address be affixed in order to operate under the special rules for radio control of remote model craft and vehicles? [3AA-10.4]
A. It must be in the operator's possession
B. It must be affixed to the transmitter
C. It must be affixed to the craft or vehicle
D. It must be filed with the nearest FCC Field Office

37. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has coordinated (recommends) the operation of one station and not the other, who is primarily responsible for resolving the interference? [3AA-11-1.1]
A. The licensee of the non-coordinated (unrecommended) repeater
B. Both repeater licensees
C. The licensee of the coordinated (recommended) repeater
D. The frequency coordinator

38. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has coordinated (recommends) the operation of both stations, who is primarily responsible for resolving the interference? [3AA-11-1.2]
A. The licensee of the repeater which has been coordinated for the longest period of time
B. Both repeater licensees
C. The licensee of the repeater which has been coordinated the most recently
D. The frequency coordinator

39. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has not coordinated the operation of either station, who is primarily responsible for resolving the interference? [3AA-11-1.3]
A. Both repeater licensees
B. The licensee of the repeater which has been in operation for the longest period of time
C. The licensee of the repeater which has been in operation for the shortest period of time
D. The frequency coordinator

40. Under what circumstances does the FCC declare a temporary state of communication emergency? [3AA-11-2.1]
A. When a declaration of war is received from Congress
B. When the maximum usable frequency goes above 28 MHz
C. When communications facilities in Washington, DC, are disrupted
D. When a disaster disrupts normal communications systems in a particular area

41. By what means should a request for a declaration of a temporary state of communication emergency be initiated? [3AA-11-2.2]
A. Communication with the FCC Engineer-In-Charge of the affected area
B. Communication with the US senator or congressman for the area affected
C. Communication with the local Emergency Coordinator
D. Communication with the Chief of the FCC Private Radio Bureau

42. What information is included in an FCC declaration of a temporary state of communication emergency? [3AA-11-2.3]
A. Designation of the areas affected and of organizations authorized to use radio communications in the affected area
B. Designation of amateur frequency bands for use only by amateurs participating in emergency communications in the affected area, and complete suspension of Novice operating privileges for the duration of the emergency
C. Any special conditions and special rules to be observed during the communication emergency
D. Suspension of amateur rules regarding station identification and business communication

43. If a disaster disrupts normal communication systems in an area where the amateur service is regulated by the FCC, what kinds of transmissions are authorized to amateur stations in such an area? [3AA-11-2.4]
A. Communications which are necessary to meet essential communication needs and facilitate relief actions
B. Communications which allow a commercial business to continue to operate in the affected area
C. Communications for which material compensation has been paid to the amateur operator for delivery into the affected area
D. Communications which are to be used for program production or newsgathering for broadcasting purposes

44. What is meant by the term broadcasting? [3AA-12.1]
A. Transmissions intended for reception by the general public, either direct or relayed
B. Retransmission by automatic means of programs or signals emanating from any class of station other than amateur
C. The transmission of any one-way radio communication, regardless of purpose or content
D. Any one-way or two-way radio communication involving more than two stations

45. Which of the following is an amateur station that cannot automatically retransmit signals of other amateur stations? [3AA-12.2]
A. Auxiliary station
B. Repeater station
C. Beacon station
D. Space station

46. Which of the following is an amateur station that is permitted to automatically retransmit signals of other amateur stations? [3AA-12.3]
A. Beacon station
B. Space station
C. Official bulletin station
D. RACES station

47. Signals from what type of radio station may be directly retransmitted by an amateur station? [3AA-12.4]
A. AM radio station
B. Police or fire department radio station
C. NOAA weather station
D. US Government communications between the space shuttle and associated Earth stations with prior approval from the National Aeronautics and Space Administration (NASA)

48. When may US Government communications between the space shuttle and associated Earth stations be directly retransmitted by an amateur station? [3AA-12.5]
A. After prior approval has been obtained from the FCC in Washington, DC
B. No radio stations other than amateur may be retransmitted in the amateur service
C. After prior approval has been obtained from the National Aeronautics and Space Administration (NASA)
D. After prior approval has been obtained from the nearest FCC Engineer-In-Charge

49. What kinds of one-way communications by amateur stations are not considered broadcasting? [3AA-13.1]
A. All types of one-way communications by amateurs are considered by the FCC as broadcasting
B. Beacon operation, remote control of a device, emergency communications, information bulletins consisting solely of subject matter of direct interest to the amateur service, and telegraphy practice
C. Only code-practice transmissions conducted simultaneously on all available amateur bands below 30 MHz and conducted for more than 40 hours per week are not considered broadcasting
D. Only actual emergency communications during a declared communications emergency are exempt

50. Which of the following one-way communications may not be transmitted in the amateur service? [3AA-13.2]
A. Transmissions to remotely control a device at a distant location
B. Transmissions to assist persons learning or improving their proficiency in Morse code
C. Brief transmissions to make adjustments to the station
D. Transmission of music

51. What kinds of one-way information bulletins may be transmitted by amateur stations? [3AA-13.3]
A. NOAA weather bulletins
B. Commuter traffic reports from local radio stations
C. Regularly scheduled announcements concerning Amateur Radio equipment for sale or trade
D. Messages directed only to amateur operators consisting solely of subject matter of direct interest to the amateur service

52. What types of one-way amateur communications may be transmitted by an amateur station? [3AA-13.4]
A. Beacon operation, radio control, code practice, retransmission of other services
B. Beacon operation, radio control, transmitting an unmodulated carrier, NOAA weather bulletins
C. Beacon operation, remote control of a device, information bulletins consisting solely of subject matter of direct interest to the amateur service, telegraphy practice and emergency communications
D. Beacon operation, emergency-drill-practice transmissions, automatic retransmission of NOAA weather transmissions, code practice

53. What types of material compensation, if any, may be involved in third-party traffic transmitted by an amateur station? [3AA-14.1]
A. Payment of an amount agreed upon by the amateur operator and the parties involved
B. Assistance in maintenance of auxiliary station equipment
C. Donation of amateur equipment to the control operator
D. No compensation may be accepted

54. What types of business communications, if any, may be transmitted by an amateur station on behalf of a third party? [3AA-14.2]
A. The FCC rules specifically prohibit communications with a business for any reason
B. Business communications involving the sale of Amateur Radio equipment
C. Communications to a business may be provided during an emergency as provided by the FCC rules
D. Business communications aiding a broadcast station

55. Does the FCC allow third-party messages when communicating with Amateur Radio operators in a foreign country? [3AA-14.3]
A. Third-party messages with a foreign country are only allowed on behalf of other amateurs.
B. Yes, provided the third-party message involves the immediate family of one of the communicating amateurs
C. Under no circumstances may US amateurs exchange third-party messages with an amateur in a foreign country
D. Yes, when communicating with a person in a country with which the US shares a third-party agreement

56. Under what circumstances, if any, may a third party participate in radio communications from an amateur station if the third party is ineligible to be a control operator of one of the stations? [3AA-15.1]
A. A control operator must be present at the control point and continuously monitor and supervise the third party participation. Also, contacts may only be made with amateurs in the US and countries with which the US has a third-party communications agreement
B. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules only if contacts are made with amateurs in countries with which the US has no third-party traffic agreement
C. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules. In addition, the control operator must key the transmitter and make the station identification.
D. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules. In addition, if contacts are made on frequencies below 30 MHz, the control operator must transmit the call signs of both stations involved in the contact at 10-minute intervals

57. Where must the control operator be situated when a third party is participating in radio communications from an amateur station? [3AA-15.2]
A. If a radio remote control is used, the control operator may be physically separated from the control point, when provisions are incorporated to shut off the transmitter by remote control
B. If the control operator supervises the third party until he or she is satisfied of the competence of the third party, the control operator may leave the control point
C. The control operator must be present at the control point
D. If the third party holds a valid radiotelegraph license issued by the FCC, no supervision is necessary

58. What must the control operator do while a third party is participating in radio communications? [3AA-15.3]
A. If the third party holds a valid commercial radiotelegraph license, no supervision is necessary
B. The control operator must tune up and down 5 kHz from the transmitting frequency on another receiver, to ensure that no interference is taking place
C. If a radio control link is available, the control operator may leave the room
D. The control operator must continuously monitor and supervise the third party's participation

59. In an exchange of international third-party communications, when is the station identification procedure required? [3AA-15.4]
A. Only at the beginning of the communications
B. At the end of each exchange of communications
C. The station identification procedure is not required during international third-party communications
D. Only at the end of multiple exchanges of communications

60. Under what circumstances, if any, may an amateur station transmit radio communications containing obscene words? [3AA-16.1]
A. Obscene words are permitted when they do not cause interference to any other radio communication or signal
B. Obscene words are prohibited in Amateur Radio transmissions
C. Obscene words are permitted when they are not retransmitted through repeater or auxiliary stations
D. Obscene words are permitted, but there is an unwritten rule among amateurs that they should not be used on the air